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DEVELOPMENT AND VALIDATION OF UV SPECTROSCOPIC METHOD FOR ESTIMATION OF SERTRALINE IN TABLET DOSAGE FORM

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ABSTRACT

Objective: To develop and validate simple, rapid, linear, accurate, precise and economical UV Spectroscopic method for estimation of Sertraline in tablet dosage form. **Methods:** The drug is freely soluble in analytical grade methanol. The drug was identified in terms of solubility studies and on the basis of melting point done on melting point apparatus of Equiptronics. It showed absorption maxima were determined in analytical grade methanol. The drug obeyed the Beer's law and showed good correlation of concentration with absorption which reflect in linearity. The UV spectroscopic method was developed for estimation of Sertraline in tablet dosage form and also validated as per ICH guidelines. **Results:** The drug is freely soluble in analytical grade methanol, slightly soluble in water and sparingly soluble in ethanol. So, the analytical grade methanol is used as a diluent in method. The melting point of Sertraline was found to be 247-248˚C (uncorrected). It showed absorption maxima 273 nm in analytical grade methanol. On the basis of absorption spectrum the working concentration was set on 10µg/ml (PPM). The linearity was observed between 6-14 µg/ml (PPM). The results of analysis were validated by recovery studies. The recovery was found to be 100.92, 101 and 99.17% for three levels respectively. The % RSD for precision was found to be 0.80% and for Ruggedness is 0.57%. **Conclusion:** A simple, rapid, linear, accurate, precise and economical UV Spectroscopic method has been developed for estimation of Sertraline in tablet dosage form. The method could be considered for the determination of Sertraline in quality control laboratories.

KEYWORDS: Sertraline, UV Spectrophotometer, Melting Point, Assay Method, Validation, Accuracy, Linearity, Ruggedness, Precision.

INTRODUCTION

Sertraline is selective serotonin reuptake inhibitor which is clinically effective for the treatment of depression, obsessive-compulsive disorder, depression relapse and social phobia.[1] Chemically it is (1S, 4S)-4 [3, 4-dichlorophenyl]-1,2,3,4 tetrahydro-N-methyl-1-naphthylamine[2] (Figure 1). Various methods have been reported for the determination of sertraline (SER) including spectrophotometry through its reaction with some acidic dyes[3] and some haloquinones. The exact mechanism of action of Sertraline is not fully known, but the drug appears to selectively inhibit the reuptake of serotonin at the presynaptic membrane. This results in an increased synaptic concentration of serotonin in the CNS, which leads to numerous functional changes associated with enhanced serotonergic neurotransmission.[4] It is suggested that these modifications are responsible for the antidepressant action observed during long term administration of antidepressants. It has also been hypothesized that obsessive-compulsive disorder is caused by the deregulation of serotonin, as it is treated by Sertraline, and the drug corrects this imbalance.[5] The serotonergic effects of sertraline may be enhanced when sertraline is combined with tricyclic antidepressants, monoamine oxidase inhibitors (MAOIs), carbamazepine, lithium or serotonergic substances.[6]

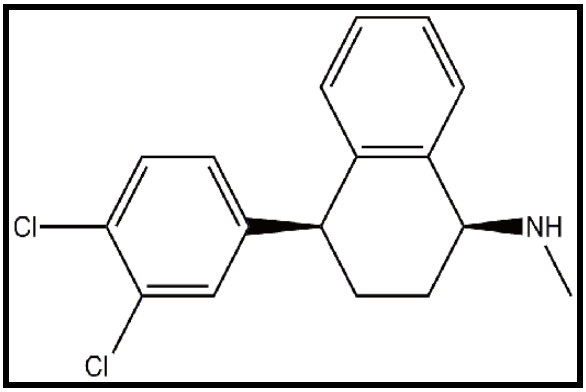

Fig. 1: Chemical Structure of Sertraline.

A good guide to the work published is found in the comprehensive monographs in its analytical profile series.[7] It was also determined in biological fluids and dosage forms by GCMS[9-11], GC[12] and HPLC methods.[13-17] Most of these methods are either tedious or require highly sophisticated instrumentation. Therefore, our target was to develop simple, economical, linear, accurate, precise and sensitive spectrophotometric methods for the determination of SER in pharmaceutical preparations.

MATERIALS AND METHODS

- **Instruments**

Shimadzu double beam UV-visible spectrophotometer 1700 Ultra with matched pair

Quartz cells corresponding to 1 cm path length and spectral bandwidth of 1 nm, Bath sonicator and citizen weighing balance.

Melting point apparatus of Equiptronics were used.

- **Materials**

Sertraline was obtained as a gift sample. Sertraline tablets were procured from local pharmacy. Methanol used was of analytical grade was used throughout the experiment. Freshly prepared solutions were employed.

Method development

A. Determination of ƛ max (10 PPM)[18, 19]

25 mg weighed amount of Sertraline was dissolved into 100 ml of volumetric flask with analytical grade methanol. Pipette out 1 ml and added in 25 ml of volumetric flask dissolved and diluted up to the mark with analytical grade methanol. This solution was subjected to scanning between 200-400 nm and absorption maximum was determined.

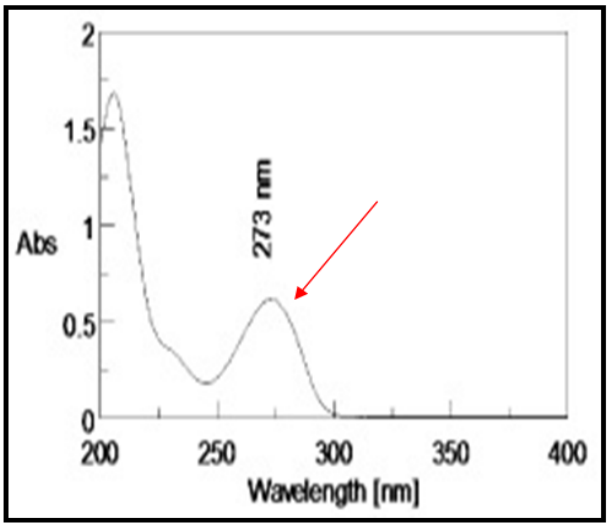

Fig. 2: Calibration Curve.

B. Preparation of Working concentration

Preparation of Standard stock solution

Standard stock was prepared by dissolving 25 mg of Sertraline in 100 ml of analytical grade methanol to get concentration of 250 µg/ml (PPM).

Preparation of Standard solution

Pipette out 1 ml from standard stock solution and diluted up to 25 ml with analytical grade methanol to get concentration of 10 µg/ml (PPM).

C. Procedure for UV reading

Blank Solution: (For Auto zero)

Fill the cuvette with analytical grade methanol. Wipe it with tissue paper properly then placed inside the chamber. Note down the reading.

Standard Solution

Fill the cuvette with standard solution. Wipe it with tissue paper properly then placed inside the chamber. Note down the reading.

Sample Solution

Fill the cuvette with sample solution. Wipe it with tissue paper properly then placed inside the chamber. Note down the reading.

D. Procedure for sample preparations[18,19,20]

For analysis of commercial formulations; twenty tablets are taken weighed it and powdered. The powder equivalent to 25 mg of Sertraline was accurately weighed and transferred into the 100 ml of volumetric flask, added 70 ml analytical grade methanol, the solution was sonicated for 20 min. After sonication cool the flask and diluted upto 100 ml with analytical grade methanol. Filtered the solution through whatmann filter paper. Pipette out 1 ml of the above solution and diluted up to 25 ml with analytical grade methanol. The absorbance was measured at 273 nm. The absorbance was recorded:

Table 1: Absorbance of Dosage Form.

Torrent Pharmaceutical Limited (50 mg)		
Sr. no.	**Sample**	**Absorbance**
1	Blank	0.0000
2	Standard	0.5275
3	Sample	0.5241

Table 2: Dosage Form Specifications.

Type	Company	M.D.	E.D.	Batch No.	Avg wt (g)	Assay (%)
1	Serta® - 50 Torrent Pharma LTD (50mg)	08/2021	05/2023	96A6E011	0.1041	99.36

E. Method of validation[18,20,21]

The proposed method was developed by using linearity, accuracy, precision and ruggedness as per ICH guidelines, 1996.

Linearity

The linearity of the proposed assay was studied in the concentration range 6 - 14 PPM at 273 nm. The calibration data showed a linear relationship between concentrations.

Table 3: Linearity Studies.

Sr. no.	Sample Concentration	Absorbance
1	6 PPM	0.3284
2	8 PPM	0.4212
3	10 PPM	0.5285
4	12 PPM	0.6162
5	14 PPM	0.7284
Correlation coefficient		0.9988 ~ 0.999

Accuracy

To ensure the accuracy of the method, recovery study was performed by preparing 3 sample solutions of 80, 100 and 120% of working concentration and adding a known amount of active drug to each sample solution and dissolved in 100ml of volumetric flask with analytical grade methanol and measuring the absorbance at 273nm.

Table 4: Accuracy Studies.

SPECTROPHOTOMETRIC METHOD			
Accuracy (%)	**Qty weighed (mg)**	**Qty found (mg)**	**Recovery (98-102%)**
80	0.8	0.81	100.92
100	1	1.01	101.00
120	1.2	1.18	99.17

Precision

The precision of the method was demonstrated by inter-day and intra-day variation studies. Five sample solutions were made and the %RSD was calculated.

Table 5: Precision studies.

Sr. No.	Sample Solution	Absorbance
1	Sample Solution 1	0.5252
2	Sample Solution 2	0.5354
3	Sample Solution 3	0.5311
4	Sample Solution 4	0.5357
5	Sample Solution 5	0.5325
MEAN		0.5320
SD		0.0043
% RSD		0.8005

Ruggedness

Ruggedness is a measure of the reproducibility of a test result under normal, expected operating condition from instrument to instrument and from analyst to analyst.

Table 6: Results for Ruggedness Studies.

Sr. No.	Analyst	Results	Mean	% Assay	% RSD
1	Analyst 1	0.5219	0.5223	98.18	0.5667
		0.5226			
2	Analyst 2	0.5245	0.5265	98.97	
		0.5284			

RESULTS

1. Solubility of Sertraline

Solubility test was passed as per criteria.

Table 7: Results for solubility studies.

Sr. no.	Title	Result
1	Analytical grade Methanol	Freely Soluble
2	Water	Slightly Soluble
3	Ethanol	Sparingly Soluble

2. Melting point of Sertraline

The melting point of Sertraline was found to be 247-248˚C (uncorrected).

3. Results for linearity for assay method of Sertraline

The linearity of method was determined at concentration level ranging from 6 to 14 µg/ml (PPM). The correlation coefficient value was found to be **(R^2) 0.9988 ~ 0.999.**

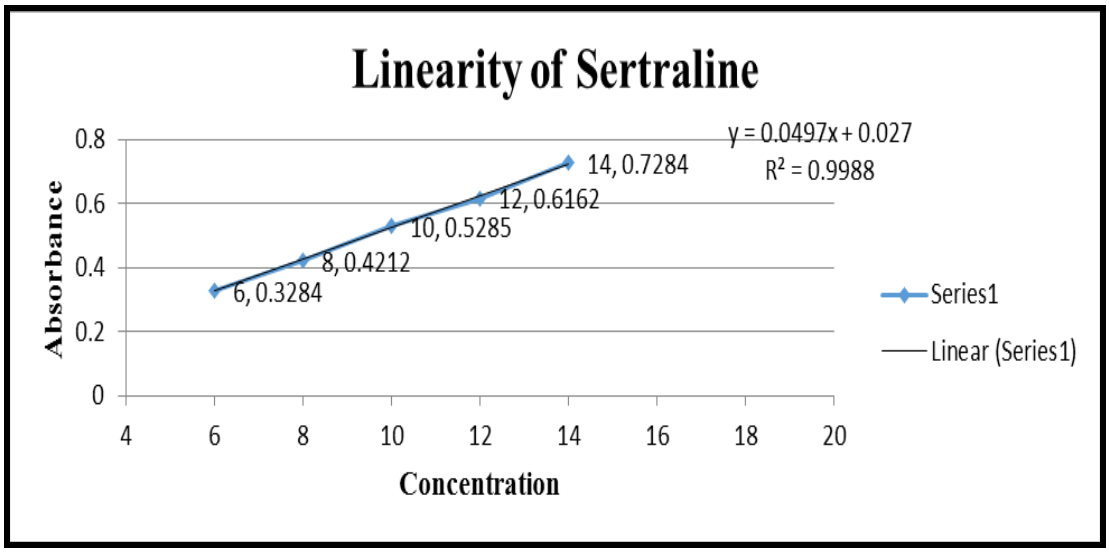

Fig. 3: Sertraline Standard Curve.

4. Results for accuracy for assay method of Sertraline

The accuracy of the method was determined by recovery experiments. The recovery studies were carried out and the percentage recovery were calculated and represented in Table - 4. The high percentage of recovery indicates that the proposed method is highly accurate. Accuracy results were found within acceptance criteria that are within 98-102%.

5. Results for precision for assay method of Sertraline

The % RSD for different sample of precision was found to be 0.8005 ~ 0.80 and it is within acceptance criteria represented in Table - 5.

6. Results for ruggedness for assay method of Sertraline

The %RSD for different sample of ruggedness was found to be 0.5667 ~ 0.57 and it is within acceptance criteria represented in Table - 6.

CONCLUSION

A method for the estimation of Sertraline in tablet form has been developed. From the spectrum of Sertraline, it was found that the maximum absorbance was 273 nm in analytical grade methanol. A good linear relationship was observed in the concentration range of 6-14 µg/ml (PPM). The high percentage recovery indicates high accuracy of the method. This demonstrates that the developed spectroscopic method is simple, linear, accurate, rugged and precise for the estimation of Sertraline in solid dosage forms. Hence, the method

could be considered for the determination of Sertraline in quality control laboratories.

ABBREVARTIONS

1. PPM - Parts per Million
2. nm - Nanometer
3. HPLC - High Performance Liquid Chromatography
4. UV - Ultra violet
5. BP - British Pharmacopoeia
6. LC - Liquid Chromatography
7. ICH - International Council for Harmonization
8. RSD - Relative Standard Deviation
9. SD - Standard Deviation
10. Qty - Quantity
11. C - Celsius
12. M.D. - Manufacturing Date
13. E.D. - Expiry Date
14. µg/ml - Microgram per milliliter
15. Avg - Average
16. Wt - Weight
17. g - gm
18. MAOIs - Monoamine Oxidase Inhibitors
19. SER - Sertraline
20. CNS - Central Nervous System

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